ELECTRON BEAM ION SOURCE

WBS 1.6 RF Systems

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1.6 RF SYSTEM for EBIS

ELECTRON BEAM ION SOURCE

Five RF systems:

- Radio Frequency Quadrupole (RFQ)
- Inter-digital-H structure (IH) Linac
- Three buncher / debuncher cavities.

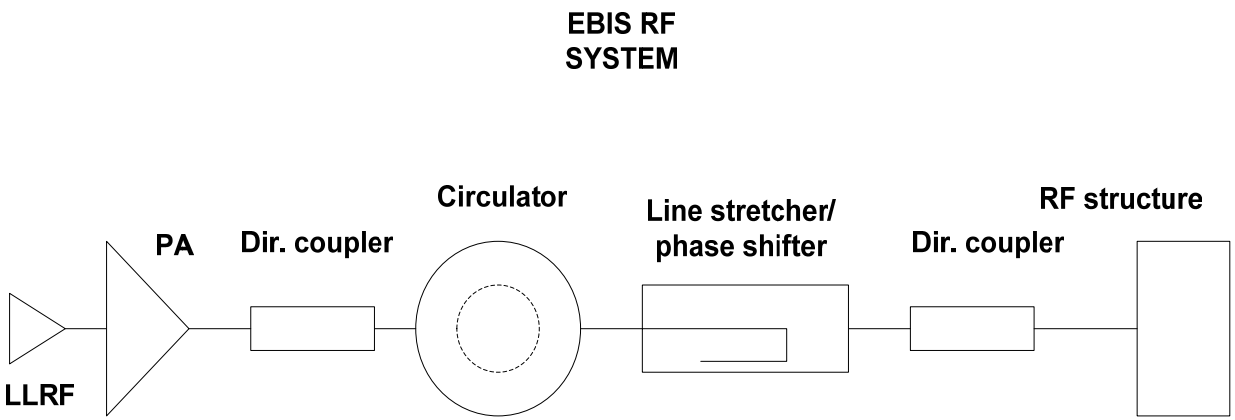
EBIS RF SYSTEMS

The RFQ and IH Linac RF systems will be pulsed systems with the pulse width of 1 mS running at 5 Hz, 400 kW peak power. Presently, we are planning to buy commercial type stand-alone FM transmitters. There are at least two companies that have already expressed interest in building them for BNL.

Each of the three bunchers will use a 4kW water-cooled solid state amplifier.

RF systems will be built to accommodate PPM with at least seven independent users, and amplitude and phase controls to compensate for the beam loading; they will not require beam locking or beam chopper.

WBS 1.6.1 High Level RF Systems



Bunchers

Frequency	100 MHz
Bandwidth	2 MHz
Average Power	4 kW
R/Q	1.5 k

RFQ & Linac

Frequency	100 MHz
Bandwidth	2 MHz
Peak power	400 kW
R/Q	108 for RFQ & 30 for Linac
Pulse width	1 mS
Pulse rise time	.2 mS max
Duty cycle	1%

WBS 1.6.2 Low Level RF Systems

- EBIS LLRF System Functionality
- Common architecture for all systems, evolving from current RHIC and AGS upgrade efforts.
- Digital IQ fast feedback to maintain RF amplitude and phase as specified. Minimum 50dB dynamic range.
- Slow feedback for structure resonance control.
- Slow feedback on beam energy if desired.
- All systems phase locked to common external master RF reference.
- System configuration and diagnostics via standard C-AD distributed controls. Rep rate, multiple users, etc. not an issue.

WBS 1.6 RF Systems

		FY'05 direct $
• Major procurements:		
• 1.6.1.1.2	RFQ Power Amp	-$400k
• 1.3	Circulator	-$17,250
• 1.6.1.2.2	Linac Power Amp	-$400k
• 2.3	Circulator	-$17,250
• 1.6.1.3.2	Buncher PA's (3ea)	-$150k
• 3.3	Circulators (3 ea)	-$15k
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• Cables/waveguides/couplers for all systems		-$100k
• HL instrumentation & controls for all systems		- $50k
• High Level RF		-$1.15M
• Low Level RF		-$135k

WBS 1.6 RF Systems

- **Estimated Cost**

WBS	Description	Direct FY'05K$			
		Mat'l	Labor	Contingency	Total
1.6	RF systems	1305	375	$470 (28%)	2150

- **Labor hours/equivalents**

Resource Category	estimated hours
Engineer	3,200
Designer	450
Technician	2425
Total	6,075
Full Time Equivalents	3.5